



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/823,559	04/14/2004	Noel C. MacDonald	UC 2003-360	4819

7590 12/02/2005  
George M. Cooper  
Jones, Tullar & Cooper, P.C.  
Eads Station  
P.O. Box 2266  
Arlington, VA 22202

EXAMINER

LE, THAO X

ART UNIT PAPER NUMBER

2814

DATE MAILED: 12/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/823,559

Applicant(s)

MACDONALD ET AL.

Examiner

Thao X. Le

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 14-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 14-19, 27 and 28 is/are rejected.
- 7) ☒ Claim(s) 19-26 is/are objected to.
- 8) ☒ Claim(s) 29-37 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 April 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 10/14/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Acknowledgement***

1. Applicant's cancellation of claims 1-13 in the amendment file on 01 November 2005 is acknowledged.

### ***Election/Restrictions***

2. Newly submitted claims 29-37 directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Claims 29-37 direct to a micromachining method of a membrane that is patentably distinct from the reactive ion etching of the MEMS elected claims 14-28. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 29-37 withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

### ***Claim Objections***

3. Claim 14 is objected to because of the following informalities: 'structure in said wafer' in line 8 should be read 'structure in said metal wafer'. Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5847454 to Shaw et al. in view of US 4923716 to Brown et al. and US 6902656 to Ouellet et al.

Regarding claim 14, Shaw discloses a method for fabricating microelectromechanical (MEMS) structures in a substrate in fig. 1A-1L, comprising: providing a mask layer 12 on a top surface of a silicon wafer 10, fig. 1A; patterning said mask layer 12, fig. 1D, to form a mask defining a MEMS structure, and deep etching the wafer 10 through said mask 12 using metal anisotropic reactive ion etching, col.10 line

Art Unit: 2814

1, with oxidation, col. 10 line 35, to provide a first cavity 22, fig. 1E, corresponding to said MEMS structure in said metal wafer.

But, Shaw does not disclose a method wherein a wafer is a metal wafer.

However, Brown discloses a method wherein a semiconductor device can be formed on a substrate comprises silicon, silicon carbide, and titanium carbide (TiC), col. 6 lines 5-8. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the substrate teaching of Brown to replace the silicon substrate of Shaw, because such substrate substitution would have been considered a mere substitution of art-recognized equivalent values, MPEP 2144.06. Furthermore, Ouellet discloses TiC would have provided a substrate having better Young' Modulus than the silicon substrate, fig. 15-16. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use the teaching of Ouellet with Shaw and Brown's teaching for intended purpose, MPEP 2144.07.

Regarding claim 15, Shaw discloses the method wherein said deep etching further depositing PECVD oxide 28, fig. 1F, on all exposed floor and wall surfaces of said cavity in said wafer; removing the oxide 28 from the floor of said cavity to expose said wafer; and further etching the exposed wafer, fig. 1H.

Regarding claims 16-17, Shaw discloses the method further including: etching to undercut the exposed wall surfaces of said cavity to produce a released MEMS structure 40', fig. 1K, wherein the method further including depositing a conductive layer 44, col. 12 line 30, on at least a portion of said mask layer, fig. 1K.

Regarding claim 18, Shaw discloses the method wherein said patterning and deep etching steps defines a released metal MEMS structure surrounded by a cavity, the process further including: filling the cavity around and under the released structure with a deposited insulator 28 removing the insulating mask layer 12 on said structure in a region where electrical contact is to be made with said structure, depositing metal 44 to make contact with said structure depositing a second insulating layer 49, col. 12 line 61, over said contact metal', and releasing said structure, fig. 1L.

7. Claims 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5847454 to Shaw et al., US 4923716 to Brown et al. and US 6902656 to Ouellet et al. as applied to claim 14 above and further in view of Us6780672 to Steele et al.

Regarding claims 27-28, Shaw does not disclose the method further including stacking and bonding multiple metal substrates containing MEMS structures and including enclosing fabricated MEMS structures to form an enclosed package.

However, Steele discloses a method in fig. 4-5 comprising stacking and bonding multiple metal substrates containing MEMS structures 300a-e, fig. 4 col. 3 lines 54-60 and including enclosing 535, col. Col. 6 line 17, fabricated MEMS structures to form an enclosed package, fig. 5. At the time the invention was made; it would have been obvious to one of ordinary skill in the art to use the MEMS stacking structure teaching of Steele with Shaw's method, because it would have achieved a high packaging density and provided protection to the MEMS structure as taught by Steele, col. 1 lines 53-55 and col.. 6 line 18.

***Allowable Subject Matter***

8. Claims 19-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art of record neither anticipated nor rendered obvious all the limitations of claim 19 including the deep etching using metal anisotropic reactive ion etching comprises alternately and repeatedly applying an oxidation plasma and an etching plasma to said wafer to cyclically oxidize and etch metal exposed through said mask.

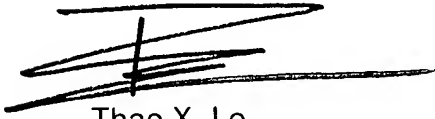
***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X. Le whose telephone number is (571) 272-1708. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on (571) 272 -1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, consisting of several horizontal strokes and a vertical line, appearing to read 'Thao X. Le'.

Thao X. Le  
21 Nov. 2005